

Single Photon Sensitive HgCdTe Avalanche Photodiode Detector (APD), Phase I

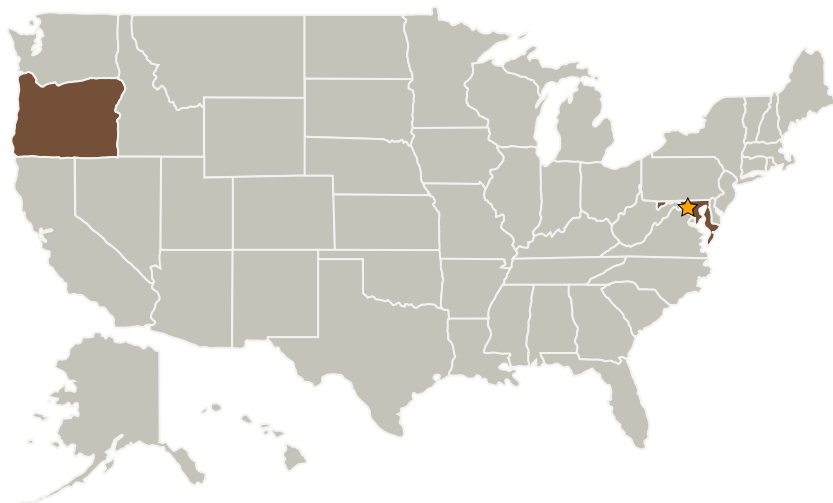
Completed Technology Project (2007 - 2007)



Project Introduction

A linear mode HgCdTe electron-initiated avalanche photodiode (EAPD) capable of 1570nm photon detection efficiency (PDE) at >10 MHz will be developed. The Phase I design, is based on vertical-charge-transport HgCdTe EAPDs recently fabricated using a 3.8-micron wavelength cutoff HgCdTe alloys, which showed excellent 1570nm response, nearly noiseless gain, >650, and GHz bandwidth operation at thermoelectric temperatures. During Phase I, we will perform tradeoff analysis to determine the optimal HgCdTe alloy composition for the application. As example, shortening the cutoff wavelength (e.g. 2-microns) will result in a HgCdTe alloy with reduce dark current and/or higher temperature operation, but will result in a concomitant gain reduction and thereby compromise PDE. In Phase I, we will develop the optimal HgCdTe LPE alloy and we will also modifying our low noise amplifiers (LNA) to match the higher capacitance of the HgCdTe APD, so optimal PDE is achieved. We will deliver at least one packaged part to NASA. During Phase II, we will further optimize the detector, integrate it with the LNA, and deliver a fully-functional, single photon counting module to NASA.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Voxtel, Inc.	Supporting Organization	Industry	Beaverton, Oregon

Primary U.S. Work Locations	
Maryland	Oregon

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.3 Heat Rejection and Storage